PATENT SPECIFICATION

750,673

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COMPLETE SPECIFICATION

Improvements in or relating to Gear Pumps and Applications thereof

We, SOCIETE DU CARBURATEUR ZENITH, of 49/51, Chemin Feuillat, Lyon, Rhône, France, a Body Corporate organised according to the laws of France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is an improvement in or a modification of the gear pump claimed in Claim 1 of our parent Application No. 2,598/53 (Serial No. 722,667), which comprises two interengaging pinions rotating in a casing and determining therein on either side of the penetration zone of the teeth of the said pinions an intake chamber and a delivery chamber, while a cylindrical housing disposed in one of the flanges of the said casing and opening into the same opposite the penetration zone of the teeth of the said pinions forms a by-pass between the said intake chamber and the said delivery chamber, and a piston sliding in the said cylindrical housing and adapted to be varied as to position so regulates the flow cross-section of the said by-pass as to reduce the said cross-section and to increase pump delivery when the said piston approaches the said pinions, the said piston increasing the flow cross-section and reducing pump delivery when moving away from the said pinions.

The present invention has as its object to provide in a pump of this type an exact regulation of the pump delivery pressure.

It is also an object of the present addition to facilitate the priming of the pump by simple means.

According to the present addition, in a gear pump according to the parent specification, the said piston is controlled by a flexible diaphragm closing a pressure chamber connected to the pump delivery chamber.

The outer face of the said diaphragm is subjected to a reference pressure, for example atmospheric pressure. Further, the said diaphragm is spring-loaded.

The said pressure chamber can further be connected to the intake chamber of the pump through a passage controlled by a loaded valve, communication between the said pressure chamber and the pump delivery being effected through a passage of small cross-section.

The following description taken in conjunction with the accompanying drawings given by way of example will make readily understood how the present addition can be carried into effect.

In the drawings:

Fig. 1 is a part-sectional elevation along the line I—I of Fig. 3 of a gear pump according to the present addition.

Fig. 2 is an elevation of the same pump, with the front flange removed.

Fig. 3 is a section through the same pump along the line III—III of Fig. 1, and

Fig. 4 is a sectional view of the same pump along the line IV—IV of Fig. 2, again with the front flange removed.

The pump illustrated in Figs. 1 to 4 comprises a casing 1 (Fig. 3) formed by a body 2 and two flanges 3 and 4.

Disposed in the casing 1 are two interengaging pinions 5 and 6. The pinion 5 is fast with a shaft 7—8. The part 8 of the shaft of the pinion 5 comprises an end 9 which has a screwdriver slot enabling the said shaft and the pinion 5 to be driven in the direction indicated by the arrow 10 (Fig. 2) by a motor (not shown) to which the pump can be fitted by means of a flange 11. The pinion 6 is fast with a shaft 12.

The pinions 5 and 6 determine in the pump casing 1, on either side of the penetration zone 13 of the teeth of the said pinions, an intake chamber 14 and a delivery chamber 15 (Fig. 2). The said chambers 14 and 15 are reached through an intake pipe 16 and delivery pipe 17 (Fig. 1) respectively. The intake pipe 16 is connected through a union 18 to the pump supply source (not shown), while the delivery pipe 17 is connected through a union 19 to the apparatus which the pump supplies and which is not shown.

A cylindrical housing 20 is disposed in the flange 4 of the casing 1 and opens into the said casing opposite the penetration zone 13 of the teeth of the pinions 5 and 6.

The cylindrical housing 20 is in unobstructed communication with the intake chamber 14 and delivery chamber 15 through two recesses 21 and 22 (Fig. 4).

The cylindrical housing 20 forms a by-pass between the delivery chamber 15 and intake chamber 14, and the flow cross-section of the said by-pass is regulated by a piston 23 sliding into the cylindrical housing 20.

The piston 23 is attached to a flexible diaphragm 24 closing a pressure chamber 25 and loaded by a spring 26, the tension of which can be adjusted by means of a screw 27.

The pressure chamber 25 communicates with the delivery chamber 15 through a passage 28 comprising an orifice 29 of small cross-section. The pressure chamber 25 also communicates, through a passage 30, with the intake chamber 14. A valve 31 disposed in the passage 30 and co-operating with a seating 32 is normally kept closed by a spring 33. The chamber 34 is separated from the pressure chamber 25 by the diaphragm 24 and communicates with atmosphere through orifices 35. The chamber 34 could be connected to a reference pressure other than atmospheric pressure.

The operation of the device is as follows:

When the pump is operating normally, liquid is drawn in through the pipe 16 and delivered through the pipe 17. The delivery pressure in the chamber 15 is transmitted through the passage 28 and orifice 29 to the pressure chamber 25 and diaphragm 24.

If the pressure transmitted to the diaphragm 24 is greater than the force of the spring 26, the said diaphragm causes the piston 23 to lift by compressing the spring 26, with the result that the by-pass running between the delivery chamber 15 and the intake chamber 14 and formed by the cylinder 20 and recesses 22 and 21 is opened. Some of the liquid returns directly through the by-pass from the delivery chamber 15 to the intake chamber 14, and the delivery of the pump falls. The delivery pressure therefore decreases and, due to the action of the spring 26, the diaphragm 24 tends to move the piston 23 in the sense of a closure of the by-pass. The diaphragm 24 and piston 23 take up an equilibrium position at which delivery pressure balances the force of the spring 26.

In practice, that end of the piston 23 opposite the pinions 5 and 6 is subjected to a pressure intermediate between the delivery pressure and the intake pressure, so that the force of the spring 26 balances the delivery pressure acting upon the diaphragm 24 and the intermediate force acting upon the piston 23.

The arrangement hereinbefore described permits a far more accurate regulation of the delivery pressure than the arrangement illustrated in Fig. 6 of the parent specification, where the piston controlling the pump by-pass is directly loaded by a spring but is not associated with a diaphragm subjected to the delivery pressure.

If the pump is located higher than the tank supplying the said pump and if, at the moment at which the pump is to be brought into operation, the ducts thereof are full of air, the priming of the pump cannot be effected by itself alone, and an auxiliary pump disposed in the intake pipe is employed for this purpose. The auxiliary pump can be electric or manually operated.

While the pump remains unprimed, no pressure is transmitted from the delivery chamber 15 to the pressure chamber 25 through the passage 28. The liquid delivered by the auxiliary pump into the intake pipe 16 and into the intake chamber 14 opens the valve 31 against the action of the spring 33 and fills the pressure chamber 25. This liquid tends to flow away towards the delivery chamber 15 and delivery pipe 17 through the orifice 29 and passage 28. However, since the orifice 29 is of small cross-section, pressure rises in the pressure chamber 25 and moves the diaphragm 24 while so compressing the spring 26 as to cause the piston 23 to rise and to cause the opening of the pump by-pass formed by the cylinder 20 and recesses 21 and 22, whereupon the liquid delivered by the auxiliary pump passes through the main pump by way of the by-pass therein.

When all the ducts have been cleared of air, the auxiliary pump is stopped and the main pump brought into operation. Since the delivery pressure of the auxiliary pump has ceased, the spring 33 closes the valve 31 and the pump operates in the manner hereinbefore described.

The auxiliary pump can also be used as an emergency pump should the main pump break down.

It is known to prime a gear pump by means of an auxiliary pump, a by-pass being arranged between the intake and delivery of the pump and a loaded valve being disposed in the said by-pass. The latter is independent of the return by-pass used during normal running to return excess delivery to the pump intake. The arrangement which forms the subject matter of the present addition makes it possible for the return by-pass used during normal operation of the pump also to be used as a priming by-pass.

What we claim is:—

1. Improvement in or modification of the

gear pump claimed in Claim 1 of the parent Application No. 2,598/53 wherein the piston regulating the cross-section of the internal by-pass is controlled by a flexible diaphragm closing a pressure chamber connected to the pump delivery chamber.

2. A gear pump according to Claim 1, wherein the outer face of the said diaphragm is subjected to a reference pressure, for example atmospheric pressure.

3. A gear pump according to Claim 1 or 2, wherein the said diaphragm is spring-loaded.

4. A gear pump according to one of the preceding claims, wherein the said pressure chamber is connected to the pump intake chamber through a passage controlled by a loaded valve, communication between the said pressure chamber and the pump delivery chamber being effected through a passage of small cross-section.

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750,673 COMPLETE SPECIFICATION
1 SHEET
This drawing is a reproduction of the Original on a reduced scale.

Fig. 4

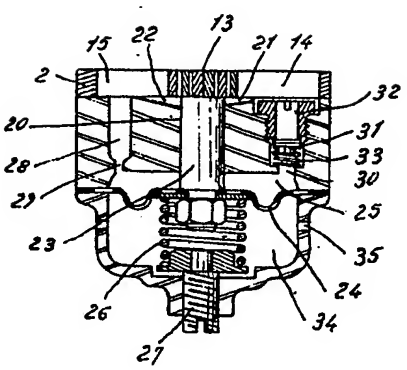

Fig. 1

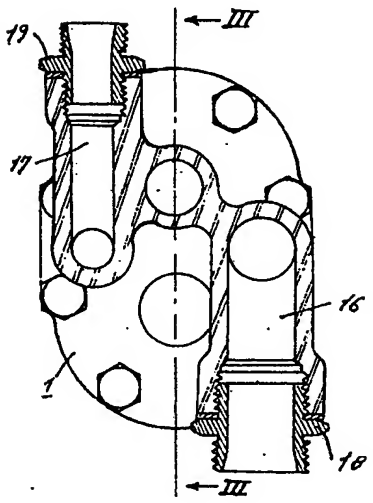

Fig. 2

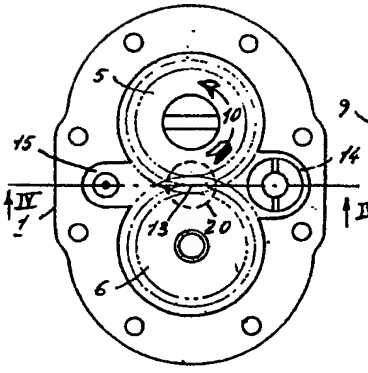

Fig. 3